IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No. 9763
Max Shtein	Examiner: David P. Turocy
Application No.: 10/690,704	Technology Center/Art Unit: 1792
Filed: October 23, 2003	DECLARATION UNDER 35 U.S.C. §1.132
For: METHOD AND APPARATUS FOR DEPOSITING MATERIAL	
Customer No.: 20350	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

In connection with the examination of the above-referenced application, I, Stephen R. Forrest, declare as follows:

1. I hold a B.A. degree in Physics from the University of California, Berkeley, and M.S. and Ph.D. degrees in Physics from the University of Michigan.

2. I am currently Vice President for Research, Materials Science and Engineering, and Director of the Optoelectronic Components and Materials Group at the University of Michigan.

3. I have been working in the fields of organic films, material deposition, and related technologies for over 25 years, and have pioneered the use of Organic Vapor Phase Deposition (OVPD) and Organic Vapor Jet Printing (OVJP) of small molecules in fabricating organic light emitting devices (OLEDs) and similar devices.

4. I am listed as an inventor or a co-inventor on over 150 United States patents, including at least 40 that relate to organic vapor deposition methods and devices formed with those methods.

5. I am a named inventor of the subject application, U.S. Application Serial No. 10/690,704, "Method and Apparatus for Depositing Material," filed October 23, 2003.

6. I am a named co-author of "Micropatterning of small molecular weight organic semiconductor thin films using organic vapor phase deposition," J. Appl. Phys., 93, 7, 2003, ("Shtein I") which has been cited in a rejection of the subject application.

7. I have reviewed the subject application, the Office Action mailed June 24, 2009 in the subject application and the "Shtein I" and "Shtein II" ("Micron-scale patterning of organic thin films using organic vapor phase deposition") references cited in the Office Action.

8. Claim 1 in the subject application recites a "dynamic pressure." A dynamic pressure results primarily from the interaction of the material ejected from the nozzle with the substrate, as described in paragraph 0042 of the application. A dynamic pressure does not necessarily result from the mere presence of a jet within a certain background pressure. For example, a 1

mm nozzle positioned 1 meter away from a substrate, ejecting a flow of material at a very low rate, would result in a negligible or no dynamic pressure regardless of the background pressure.

9. Shtein I primarily describes simulations and experiments performed for OVPD processes in which a carrier gas is used to transport organic vapor toward a cooled substrate by diffusion. Shtein I also describes the effects of using a mask placed on or over the substrate to obtain selective or patterned deposition.

10. Section VII of Shtein I describes simulations we performed to investigate the effect of replacing diffusive transport at the OVPD boundary layer with a high-speed jet of carrier gas delivered through a nozzle. A first simulation treated the molecules of carrier gas and organic vapor as solid particles capable of elastic collision, essentially treating them as bullets moving at a high velocity and neglecting any gas flow effects. The simulation assumed $du_z/dz = 0$, i.e., that there was no change in velocity of the molecules in the direction of the substrate. A second simulation applied the Navier-Stokes equations to approximate a flow from a nozzle. This simulation ignored the molecular nature of the flow, essentially modeling a pure fluid.

11. Neither of the simulations described in Section VII accounts for pressure differentials that would occur between a nozzle and a substrate, and neither simulation models the presence of a dynamic pressure. The simulations are not accurate models of a real system. A real, physical system cannot be constructed that has the mathematical properties used in either simulation.

12. One of skill in the art would not be able to determine the importance of the dynamic pressure system from the simulations described in Shtein I. In fact, because these simulations do

not fully model the molecular and fluidic nature of a carrier gas transporting an organic material as used in OVJP, and because they do not account for pressure differentials in the region of the substrate, they exclude the presence or effect of any dynamic pressure. The simulations also would not suggest the presence or desirability of a dynamic pressure in an OVJP system to one of skill in the art.

13. The "Shtein II" reference cited in the Office Action is a presentation that describes the findings of Shtein I. The simulations, results, and parameters described in Shtein II refer to diffusive OVPD processes. Shtein II does not describe any way to perform OVJP or otherwise use a nozzle or jet instead of a diffusive process with a mask, nor does it indicate the desirability of a dynamic pressure or indicate how to achieve a dynamic pressure.

14. Shtein II includes the text "Organic vapor jet deposition: for home office?" , but one of skill in the art would not conclude from this text that the OVPD processes described in Shtein II could be performed using a nozzle and jet instead of a mask. In fact, one of skill in the art would not be able to determine how to perform jet-based deposition using a nozzle based on the disclosure of OVPD in Shtein II.

15. One of skill in the art would not interpret the claimed "nozzle" to encompass a "mask" as described in Shtein I and Shtein II, even if a gas was directed at and through the mask as suggested in the Office Action. In the art, a "mask" refers to a sheet placed between a substrate and a material source that blocks those portions of the substrate on which no deposition is desired. The mask blocks material from being deposited on certain regions of a substrate; in these regions the material is deposited on the mask instead of the substrate. In contrast, a "nozzle" would be understood by one of skill in the art to refer to a device that is sealed to a

material source such as a fluid, gas, or other material, and that channels the material as it exits the device. The differences between a mask and a nozzle allow for the use of different and more efficient operating parameters. For example, a nozzle may be heated to prevent buildup of material on the nozzle when ejecting a heated organic vapor from the nozzle. A mask, however, typically cannot be heated without damaging the underlying substrate.

16. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed,

Stephen R. Forrest

Dated: 12/3/09